

CLASS 708, ELECTRICAL COMPUTERS: ARITHMETIC PROCESSING AND CALCULATING

SECTION I - CLASS DEFINITION

GENERAL STATEMENT OF THE CLASS SUBJECT MATTER

This is the generic class for electrical apparatus and corresponding methods for performing calculation operations.

SCOPE OF THE CLASS

- (1) Note. This class is limited to electrical and calculating computer apparatus and corresponding methods wherein a calculation operation is performed on information carried by wave propagation (either electromagnetic or compressional waves) provided that input to and output from the apparatus is electrical. Note: where the apparatus performing the calculation operation is electrically responsive but the data is not presented to and output from the apparatus as electrical signals, classification is with the appropriate wave energy subject matter, as per one of the optical classes.
- (2) Note. Significantly claimed apparatus external to this class, claimed in combination with apparatus under the class definition, which perform data processing or calculation operations are classified in the class appropriate to the external device unless specifically excluded therefrom.
- (3) Note. Nominally claimed apparatus external to this class in combination with apparatus under the class definition is classified in this class unless provided for in the appropriate external class.

THIS CLASS IS STRUCTURED INTO THREE MAIN DIVISIONS:

- A. Electrical Hybrid Calculating Computers
- B. Electrical Digital Calculating Computers
- C. Electrical Analog Calculating Computers

SECTION II - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

- 235, Registers, various subclasses for basic machines and associated indicating mechanisms for ascertaining the number of movements of various devices and machines, plus machines made from these basic machines alone (e.g., cash registers, voting machines) or in combination with various perfecting features, such as printers and recording means, as well as for various data bearing record controlled systems.
- 307, Electrical Transmission or Interconnection Systems, various subclasses for generic residual electrical transmission or interconnection systems and miscellaneous circuits.
- 326, Electronic Digital Logic Circuitry, various subclasses for digital logic devices.
- 327, Miscellaneous Active Electrical Nonlinear Devices, Circuit, and Systems, various subclasses for miscellaneous active device analog circuits.
- 340, Communications: Electrical, various subclasses for residual electrical communication systems.
- 341, Coded Data Generation or Conversion, various subclasses for electrical pulse and digital code converters.
- 345, Computer Graphics Processing, Operator Interface Processing, and Selective Visual Display Systems, various subclasses for the selective control of two or more light generating or light controlling display elements in accordance with a received image signal.
- 359, Optics: Systems (Including Communication) and Elements, subclasses 107+ for optical computing without diffraction and subclasses 237+ for optical modulators.
- 360, Dynamic Magnetic Information Storage or Retrieval, appropriate subclasses for record carriers and systems wherein information is stored and retrieved by interaction with a medium and there is relative motion between a medium and a transducer, for example, magnetic disk drive devices and control thereof, per se.
- 361, Electricity: Electrical Systems and Devices, subclasses 679+ for housing or mounting of electronic device or system which may provide keyboard or computer support.

- 364, Electrical Computers and Data Processing Systems, subclasses 130+ for data processing control systems, subclasses 400+ for particular application of electrical computers and data processing systems.
- 365, Static Information Storage and Retrieval, various subclasses for addressable static singular storage elements or plural singular storage elements of the same type.
- 369, Dynamic Information Storage or Retrieval, various subclasses for record carriers and systems wherein information is stored and retrieved by interaction with a medium and there is relative motion between a medium and a transducer.
- 370, Multiplex Communications, various subclasses for generic multiplexing and demultiplexing systems.
- 375, Pulse or Digital Communications, various subclasses for generic pulse or digital communication systems.
- 377, Electrical Pulse Counters, Pulse Dividers, or Shift Registers: Circuits and Systems, various subclasses for generic circuits for pulse counting.
- 379, Telephonic Communications, various subclasses for two-way electrical communication of intelligible audio information of arbitrary content over a link including an electrical conductor.
- 382, Image Analysis, appropriate subclasses for operations performed on image data with the aim of measuring a characteristic of an image, detecting variations, detecting structures, or transforming the image data, and for procedures for analyzing and categorizing patterns present in image data.
- 395, Information Processing System Organization, subclasses 80+ for robot control, subclasses 101+ for static data presentation processing, and subclasses 500 and 527 for simulation, emulation, or computability of system components.
- 701, Data Processing: Vehicles, Navigation, and Relative Location, appropriate subclasses for vehicular or navigational data processing.
- 702, Data Processing: Measuring, Calibrating, and Testing, appropriate subclasses for measuring or testing data processing.
- 704, Data Processing: Speech Signal Processing, Linguistics, Language Translation, and Audio Compression/Decompression for speech, language or audio compression/decompression processing.
- 705, Data Processing: Financial, Business Practice, Management, or Cost/Price Determination, appropriate subclasses for data processing related to business, finances, management, or cost/price determining.
- 706, Data Processing: Artificial Intelligence, appropriate subclasses for processing of artificial intelligence.
- 707, Data Processing: Databases and File Management, Data Structures, and Document Processing appropriate subclasses for database structure, database/file management, or document processing.
- 709, Electrical Computers and Digital Processing Systems: Multiple Computer or Process Coordinating, appropriate subclasses for computers and digital processing related to plural computers or plural process coordinating.
- 710, Electrical Computers and Digital Processing Systems: Input/Output, appropriate subclasses for input/output processing (e.g., bus processing) in a computer or digital data processing system.
- 711, Electrical Computers and Digital Processing Systems: Memory, appropriate subclasses for storage accessing, control, or addressing in a computer or digital processing system.
- 712, Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors), appropriate subclasses for computer or digital processing system architecture or instruction processing.
- 713, Electrical Computers and Digital Processing Systems: Support, appropriate subclasses for computer or digital processing system support (e.g., security, power supply, and timing, etc.)
- 714, Error Detection/Correction and Fault Detection/Recovery, appropriate subclasses for error or fault detection or compensation in a computer or digital processing system.

SECTION III - GLOSSARY

CALCULATION OPERATIONS

Arithmetic or some limited logic operations performed upon or with signals representing numbers or values. These include arithmetic and related logic operations. A related logic operation is one that is associated with arithmetic computations.

DISCRETE ELECTRICAL SIGNAL

Discontinuous signals which can assume only a finite number of states.

NUMERICAL DIGITS

Symbols that represent a specific quantity or amount of units.

SUBCLASSES

1 **ELECTRICAL HYBRID CALCULATING COMPUTER:**

This subclass is indented under the class definition. Subject matter wherein a calculation operation is performed either simultaneously or sequentially upon at least one analog and at least one digital signal or wherein either the analog or digital signal is involved in a calculation operation on the other signal.

- (1) Note. This subclass does not include the mere conversion from one signal format to another, which conversion has no part in the above calculation operation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

100+, for electrical digital calculating computers.
800+, for electrical analog calculating computers.

2 **Plural complete computers:**

This subclass is indented under subclass 1. Subject matter which includes at least one complete analog computer and one complete digital computer.

3 **Particular function performed:**

This subclass is indented under subclass 1. Subject matter directed to a particular function performed by hybrid computer or subcombination thereof in making computation.

- (1) Note. For classification herein, the function performed must be significantly claimed in making a computation.

4 **Evaluation of trigonometric function:**

This subclass is indented under subclass 3. Subject matter wherein the function performed is the processing of signal to either determine a trigonometric relationship or to operate on a

signal in accordance with a trigonometric relationship.

SEE OR SEARCH THIS CLASS, SUBCLASS:

440, and 811+ for electrical digital or electrical analog computers which perform the function of evaluation of trigonometric functions.

5 **Correlation, convolution, or transformation:**

This subclass is indented under subclass 3. Subject matter wherein the function performed is cross-correlation, autocorrelation, cross-convolution, autoconvolution or transforming a given representation of a data signal to another representation without loss of information by an orthogonal transformation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

400+, 420+, 422+, 813+, and 820+ for electrical digital or analog computers which perform the function of correlation, convolution or transformation.

6 **Integration or differentiation:**

This subclass is indented under subclass 3. Subject matter wherein the function performed is integration or differentiation of at least one of a plurality of input signals.

SEE OR SEARCH THIS CLASS, SUBCLASS:

443, and 444, for electrical digital calculating differentiation and integration, respectively computers which perform.
822, and 823+, for electrical analog computers which perform differentiation and integration, respectively.

7 **Multiplication or division:**

This subclass is indented under subclass 3. Subject matter wherein the function performed is multiplication or division to produce a product or quotient from at least two input signals.

SEE OR SEARCH THIS CLASS, SUBCLASS:

620+, and 650+, for electrical digital computers for performing the function of multiplication or division.

835+, and 844, for electrical analog computers for performing the function of multiplication or division.

8

Function generation:

This subclass is indented under subclass 3. Subject matter wherein the function performed is the generation of at least one signal by mathematical operation or as part of a mathematical operation generates a signal representing a function of at least one variable input parameter.

- (1) Note. This subclass includes a waveform synthesizer wherein the waveform is internally generated.

SEE OR SEARCH THIS CLASS, SUBCLASS:

270+, and 845+, for electrical digital or electrical analog computers which perform the function of function generation.

SEE OR SEARCH CLASS:

327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 100+ for miscellaneous signal converting, shaping, or generating circuits.

9

Piece-wise linear synthesis:

This subclass is indented under subclass 8. Subject matter wherein the desired function is approximated by a series of segments of straight lines.

SEE OR SEARCH THIS CLASS, SUBCLASS:

846+, for analog computer piece-wise linear synthesis.

100

ELECTRICAL DIGITAL CALCULATING COMPUTER:

This subclass is indented under the class definition. Subject matter wherein a calculation operation is performed upon discrete electrical signals representing a value normally described by numerical digits.

- (1) Note. The value described includes a value represented by a pulse repetition rate.

SEE OR SEARCH THIS CLASS, SUBCLASS:

1+, for electrical hybrid calculating computers.

800+, for electrical analog calculating computers.

SEE OR SEARCH CLASS:

326, Electronic Digital Logic Circuitry, appropriate subclasses for digital logic devices.

101

Pulse repetition rate:

This subclass is indented under subclass 100. Subject matter wherein quantities are determinable from the pulse repetition frequency of the discrete electrical signal.

SEE OR SEARCH CLASS:

341, Coded Data Generation or Conversion, subclasses 54+ for digital conversion where a bit is represented by a discrete frequency.

102

Digital differential analyzer:

This subclass is indented under subclass 101. Subject matter utilized as a digital differential analyzer.

SEE OR SEARCH THIS CLASS, SUBCLASS:

804, for analog differential analyzers.

103

Multiplication or division:

This subclass is indented under subclass 101. Subject matter wherein the operation performed on an electrical signal is multiplication or division.

SEE OR SEARCH CLASS:

327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 113+ for miscellaneous frequency control.

332, Modulators, subclasses 112+ for pulse frequency modulators.

377, Electrical Pulse Counters, Pulse Dividers, or Shift Registers: Circuits and Systems, appropriate subclasses for pulse dividing and multiplying circuits.

- 104 Plural complete computers:**
This subclass is indented under subclass 100. Subject matter which includes at least two complete digital computers.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
2, for a hybrid computer formed from plural complete computers.
- SEE OR SEARCH CLASS:
364, Electrical Computers and Data Processing Systems, subclasses 131+, for plural programmable computers used in a control system.
- 105 Combined with diverse art device:**
This subclass is indented under subclass 100. Subject matter which includes a diverse art device having a noncalculating function, with common structure utilized in performing the calculating and the noncalculating functions, or an integrated unit into which the computer and diverse art device are embodied.
- (1) Note. Search the art area of the diverse device for the details of the diverse device which are claimed.
- 106 Checkbook:**
This subclass is indented under subclass 105. Subject matter where the diverse device is a checkbook.
- SEE OR SEARCH CLASS:
283, Printed Matter, subclass 58 for banking checks, per se.
- 107 Writing instrument (e.g., pen):**
This subclass is indented under subclass 105. Subject matter where the diverse device is utilized for a hand-held marking purpose.
- SEE OR SEARCH CLASS:
401, Coating Implements With Material Supply, appropriate subclasses for pens or pencils, per se.
- 108 Tape recorder:**
This subclass is indented under subclass 105. Subject matter where the diverse device is a tape recorder.
- SEE OR SEARCH CLASS:
360, Dynamic Magnetic Information Storage or Retrieval, appropriate subclasses, for detail of a magnetic tape recorder, per se.
- 109 Communication device (e.g., telephone, radio, television):**
This subclass is indented under subclass 105. Subject matter where the diverse device transfers information between distant points.
- SEE OR SEARCH CLASS:
348, Television, subclass 552 for particular television structure combined with a calculator.
379, Telephonic Communications, subclass 110.01 for particular telephonic substation structure combined with a calculator.
455, Telecommunications, subclasses 344+ for particular receiver or analog modulated signal frequency converter structure combined with a calculator.
- 110 Business device (e.g., billing, memorandum):**
This subclass is indented under subclass 105. Subject matter where the diverse device is used in the conducting of trade.
- (1) Note. Typical of subject matter found here would be a calculator of generic utility combined with a customer billing device.
- SEE OR SEARCH CLASS:
705, Data Processing: Financial, Business Practice, Management, or Cost/Price Determination, appropriate subclasses for data processing systems exclusively designed for or utilized in a business environment.
- 111 Horological device:**
This subclass is indented under subclass 105. Subject matter where the diverse device measures or indicates time.

SEE OR SEARCH CLASS:

368, Horology: Time Measuring Systems or Devices, subclass 10 for a nominal digital calculating computer in combination with a horological device.

112 Calendar:

This subclass is indented under subclass 111. Subject matter where the horological device provides indication of a day of the week or a date.

SEE OR SEARCH CLASS:

368, Horology: Time Measuring Systems or Devices, subclasses 28+ for a calendar indicator, per se.

130 Programmable calculator:

This subclass is indented under subclass 100. Subject matter which includes a calculator that is programmable.

- (1) Note. Calculator does not include general purpose computers but is restricted to the limited capacity calculator such as desk calculator or a pocket calculator.

SEE OR SEARCH CLASS:

713, Electrical Computers and Digital Processing Systems: Support, subclass 321 for a programmable calculator with power saving feature.

131 Having specialized input:

This subclass is indented under subclass 100. Subject matter with specialized input in conjunction with calculation portion.

- (1) Note. For classification herein, the calculating portion must be a significant component and the input to the calculating portion must be more than nominally recited.

SEE OR SEARCH CLASS:

200, Electricity: Circuit Makers and Breakers, subclass 5 for a multiple switch assembly, per se.
235, Registers, subclasses 145+ for keyboards.
341, Coded Data Generation and Conversion, subclasses 22+ for a keyboard controlled code transmitting device.

345, Computer Graphics Processing, Operator Interface Processing, and Selective Visual Display Systems, subclasses 156+ for display peripheral interface input device.

348, Television, subclass 552 for video input devices for computers.

710, Electrical Computers and Digital Processing Systems: Input/Output, appropriate subclasses for input/output and bus data processing.

132 Having supplemental environment related input:

This subclass is indented under subclass 131. Subject matter where input unique to a particular art area can be provided in addition to normal calculator input.

- (1) Note. Typically found here is non-numeric environment related input.

133 Cooking:

This subclass is indented under subclass 132. Subject matter where the supplemental input relates to the preparation of food for consumption.

- (1) Note. Typical of subject matter found here is nonnumeric input designating a particular food to be cooked.

SEE OR SEARCH CLASS:

99, Foods and Beverages: Apparatus, subclasses 324+ for particular cooking apparatus.

134 Business:

This subclass is indented under subclass 132. Subject matter where the supplemental input relates to the conduct of trade.

SEE OR SEARCH CLASS:

705, Data Processing: Financial, Business Practice, Management, or Cost/Price Determination, appropriate subclasses for data processing systems exclusively designed for or utilized in a business environment.

135 For security:

This subclass is indented under subclass 131. Subject matter where a specialized input controls accessing of the calculating computer.

- 136 Input verification:**
This subclass is indented under subclass 131. Subject matter where the specialized input provides a check of intended versus actual input.
- 137 Fraction input:**
This subclass is indented under subclass 131. Subject matter where the specialized input permits entry of a fraction.
- 138 Flexible input:**
This subclass is indented under subclass 131. Subject matter in which some portion of the input is made nonrigid to facilitate data entry.
- 139 Including specific computing system interconnection:**
This subclass is indented under subclass 131. Subject matter for specific structure within the specialized input serving as an interface between the device actually manipulated by the operator and computing circuitry.
- (1) Note. Included here would be keyboard input which includes specific structure linking the keyboard, per se, with computing circuitry, for example.
- 140 Modular or overlay:**
This subclass is indented under subclass 131. Subject matter where plug-in modules or overlays are utilized to effect data input.
- 141 Including specific nonkeyboard-type information entry:**
This subclass is indented under subclass 131. Subject matter where information ultimately conveyed to the calculating portion is produced by a particular device not having plural individually actuatable keys.
- 142 Including specific keyboard-type information entry:**
This subclass is indented under subclass 131. Subject matter where information ultimately conveyed to the calculating portion is produced by a particular device having plural individually actuatable keys.
- SEE OR SEARCH CLASS:
200, Electricity: Circuit Makers and Breakers, appropriate subclasses for switches, per se.
- 341, Coded Data Generation or Conversion,** subclasses 22+ for a keyboard controlled code transmitting device.
- 345, Computer Graphics Processing, Operator Interface Processing, and Selective Visual Display Systems,** subclasses 168+ for display peripheral interface input device including keyboard.
- 143 Nonmechanical key actuation:**
This subclass is indented under subclass 142. Subject matter where input keys are operated by other than a push and release sequence (e.g., magnetic activation).
- SEE OR SEARCH CLASS:
335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, appropriate subclasses for magnetic switches, per se.
337, Electricity: Electrothermally or Thermally Actuated Switches, appropriate subclasses for thermal switches per se.
- 144 User definable key:**
This subclass is indented under subclass 142. Subject matter in which the user defines the function associated with a keyboard key.
- SEE OR SEARCH CLASS:
345, Computer Graphics Processing, Operator Interface Processing, and Selective Visual Display Systems, subclass 172 for a display peripheral keyboard having a programmable function key.
- 145 Plural function key:**
This subclass is indented under subclass 142. Subject matter where a keyboard key has plurality of selectable predetermined functions associated with it.
- 146 Key sequencing (i.e., sequence defines function):**
This subclass is indented under subclass 142. Subject matter where the order in which a plurality of keys is actuated determines the function to be performed.

160 Having specialized output:

This subclass is indented under subclass 100. Subject matter with specialized output in conjunction with calculating portion.

- (1) Note. For classification herein, the calculating portion must be a significant component and the output from the calculating portion must be more than nominally recited.

SEE OR SEARCH CLASS:

- 340, Communication: Electrical, subclasses 815.4+ for visual indicators.
345, Computer Graphics Processing, Operator Interface Processing, and Selective Visual Display Systems, appropriate subclasses for selective visual display systems and computer graphics processing.
710, Electrical Computers and Digital Processing Systems: Input/Output, appropriate subclasses for input/output and bus data processing.

161 Having supplemental environment related output:

This subclass is indented under subclass 160. Subject matter where output unique to a particular art area can be provided in addition to normal calculator output.

- (1) Note. Typically found here is non-numeric environment related output.

162 Teaching:

This subclass is indented under subclass 161. Subject matter where the supplemental output relates to education.

SEE OR SEARCH CLASS:

- 434, Education and Demonstration, appropriate subclasses for instructional devices, per se.

163 Business:

This subclass is indented under subclass 161. Subject matter where the supplemental output relates to the conduct of trade.

SEE OR SEARCH CLASS:

- 705, Data Processing: Financial, Business Practice, Management, or Cost/Price Determination, appropriate subclasses for data processing systems exclusively designed for or utilized in a business environment.

164 Output verification:

This subclass is indented under subclass 160. Subject matter in which the output is provided in a form permitting checking thereof (e.g., trace).

165 Blanking:

This subclass is indented under subclass 160. Subject matter where the specialized output has provision for suppressing a selected portion of the output.

166 Zero suppression:

This subclass is indented under subclass 165. Subject matter wherein the blanking means has zero suppression capability.

167 Prompting:

This subclass is indented under subclass 160. Subject matter where the specialized output provides the user with guidance regarding future information entry.

168 Selective output:

This subclass is indented under subclass 160. Subject matter where the specialized output permits choosing the desired output from a plurality of candidates.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 174, for multiple simultaneous outputs.

169 Sequential output:

This subclass is indented under subclass 160. Subject matter where the specialized output provides successive portions of a desired output one at a time.

170 Using particular format:

This subclass is indented under subclass 160. Subject matter where the specialized output provides the output in a specified form.

- (1) Note. The particular format might be engineering notation or floating point, for example.
- 171 Symbol accompanying output:**
This subclass is indented under subclass 160. Subject matter in which the specialized output provides a special symbol with the output representation.
- 172 Audio:**
This subclass is indented under subclass 160. Subject matter where the specialized output is in audible form.
- SEE OR SEARCH CLASS:
364, Electrical Computers and Data Processing Systems, subclasses 131+, for plural programmable computers used in a control system.
381, Electrical Audio Signal Processing Systems and Devices, appropriate subclasses for electrical audio signal processing in general.
- 173 Printer:**
This subclass is indented under subclass 160. Subject matter in which the specialized output provides the output representation in permanent readable form.
- SEE OR SEARCH CLASS:
347, Incremental Printing of Symbolic Information, appropriate subclasses for incremental printing (e.g., ink jet printing).
395, Information Processing System Organization, subclasses 101+ for static presentation processing (e.g., for a printer).
- 174 Multiple simultaneous outputs:**
This subclass is indented under subclass 160. Subject matter where a plurality of output representations are made available by the specialized output at the same time.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
168, for selective output.
- 190 Integrated circuit:**
This subclass is indented under subclass 100. Subject matter wherein the calculating is effected by an integrated circuit or chip, the use or specific structure or arrangement of which significantly affects or directs the handling of information.
- SEE OR SEARCH CLASS:
257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), appropriate subclasses for integrated circuit structure with active solid-state devices, subclass 446 and 499+ for integrated circuit devices with electrically isolated components, in general, and other appropriate subclasses for specific type devices in integrated circuits.
326, Electronic Digital Logic Circuitry, subclasses 101+ for electronic logic with significant integrated structure.
327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 564+ for miscellaneous circuits with integrated structure.
- 191 Electro-optical:**
This subclass is indented under subclass 100. Subject matter wherein the calculating is effected by electro-optical devices.
- SEE OR SEARCH CLASS:
359, Optics: Systems (Including Communication) and Elements subclasses 107+ for optical computing without diffraction and subclasses 237+ for optical modulators.
- 192 Bubble-domain:**
This subclass is indented under subclass 100. Subject matter wherein the calculating is effected by bubble-domain devices.
- SEE OR SEARCH CLASS:
365, Static Information Storage and Retrieval, subclasses 1+ for magnetic bubble-domain devices used for storage of information.

200 Particular function performed:

This subclass is indented under subclass 100. Subject matter having a particular function involving a calculation performed by digital computer or subcombination thereof.

- (1) Note. For classification herein, the calculating performed in effecting the function must be significantly claimed.

SEE OR SEARCH CLASS:

712, Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors) subclasses 1+ for particular processing architecture which could be utilized in performing the particular function.

201 Absolute value or magnitude:

This subclass is indented under subclass 200. Subject matter wherein the particular function determines the absolute value or magnitude of a result from an arithmetic operation.

SEE OR SEARCH CLASS:

327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclass 354 for a specific input-to-output function performed by an absolute value.

202 Median:

This subclass is indented under subclass 200. Subject matter wherein the particular function provides the middle value in a series.

203 Compression/decompression:

This subclass is indented under subclass 200. Subject matter for representing a number or group of numbers by a smaller number of digits than that possessed originally or the inverse operation.

SEE OR SEARCH CLASS:

341, Coded Data Generation or Conversion, subclass 60 for digital conversion to or from a packed format.
348, Television, subclasses 384+ for a bandwidth reduction system.
382, Image Analysis, subclasses 232+ for data compression in an image processing system.

709, Electrical Computer and Digital Processing Systems: Multiple Process or Process Coordinating subclasses 247+ for data compressing/decompressing in computer data transfer.

204 Format conversion:

This subclass is indented under subclass 200. Subject matter for changing a number having a representation in one form to a representation in another form.

SEE OR SEARCH CLASS:

341, Coded Data Generation or Conversion, subclasses 50+ for digital-to-digital converters.

205 Normalization:

This subclass is indented under subclass 204. Subject matter in which the number in final form includes a single nonzero digit to the left of a radix point.

SEE OR SEARCH THIS CLASS, SUBCLASS:

495+, for floating point systems.

206 Unit conversion:

This subclass is indented under subclass 200. Subject matter where a number reflecting a first system of measurement is changed to reflect a second system of measurement.

- (1) Note. Included here are such conversions as English to metric.

207 Maximum/minimum determination:

This subclass is indented under subclass 200. Subject matter in which the largest or smallest of a group of numbers is found.

208 Scaling:

This subclass is indented under subclass 200. Subject matter where a number is modified by a predetermined multiplicative factor.

209 Shifting:

This subclass is indented under subclass 200. Subject matter where a number is changed by moving each digit therein simultaneously a specified number of positions in a specified direction.

- (1) Note. Digits that are shifted beyond the confines of the number may or may not be recirculated into the opposite end of the number. Fixed digits may be inserted there instead.

SEE OR SEARCH CLASS:

- 377, Electrical Pulse Counters, Pulse Dividers, or Shift Registers: Circuits and systems, appropriate subclasses for shift registers.
- 712, Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors), subclass 898 for byte word order rearranging.

210 Determining number of like-valued bits in word:

This subclass is indented under subclass 200. Subject matter where the number of 1's or the number of 0's in a binary word is determined.

211 Determining number of like-valued leading or trailing bits:

This subclass is indented under subclass 200. Subject matter where the number of consecutive leading or trailing 1's or 0's in a binary word is determined.

212 Detecting particular sequence of bits:

This subclass is indented under subclass 200. Subject matter for locating a particular string of bits in a larger string of bits.

SEE OR SEARCH CLASS:

- 375, Pulse or Digital Communications, subclasses 354+ for synchronizers, per se.
- 712, Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors), subclass 898 for byte-word sequence detecting.

230 Multifunctional:

This subclass is indented under subclass 200. Subject matter wherein the electric digital calculating computer provides for selectively performing at least one logical operation as well as at least one arithmetical operation relative to operands (e.g., a programmable logic circuit with computational means).

SEE OR SEARCH CLASS:

- 307, Electrical Transmission or Interconnection Systems, subclasses 407+ for nonlinear reactor logic circuits.
- 326, Electronic Digital Logic Circuitry, subclasses 37+ for programmable logic circuits not performing arithmetic calculations and which are typically solid state.
- 365, Static Information Storage and Retrieval, appropriate subclasses for programmable logic circuits which include storage and retrieval of information.

231 Microprocessor:

This subclass is indented under subclass 230. Subject matter wherein the multifunctional operation is performed by a microprocessor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 303, for a particular microprocessor used in a filtering operation.
- 510, for a particular microprocessor used in floating point.

SEE OR SEARCH CLASS:

- 712, Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors), subclasses 32+ for particular microprocessor architecture.

232 Array of elements (e.g., AND/OR array, etc.):

This subclass is indented under subclass 230. Subject matter wherein the multifunctional operation is performed by a group of many similar, basic, complex, or integrated elements without separated enclosures, such as AND/OR arrays, etc.

233 Pipeline:

This subclass is indented under subclass 230. Subject matter wherein the multifunctional operation is performed in a pipeline where the output of one task is input to another until a desired sequence of tasks has been carried out.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:
 406, for Fourier transformation performed in a particular pipeline.
 508, for floating point performed in a particular pipeline.
 521, for arithmetical pipeline operation in general.
 631, for multiple digit binary multiplication performed in a particular pipeline.
- 234 Parallel bit input of operand:**
 This subclass is indented under subclass 230. Subject matter wherein the multifunctional operation is performed in bit level and the bits of operands are input in parallel.
- 235 Uses look-up table:**
 This subclass is indented under subclass 230. Subject matter wherein the operation involves a look-up table to search for a desired item of information.
- 236 More than two operands:**
 This subclass is indented under subclass 230. Subject matter wherein the operations involve three or more operands.
- 250 Random number generation:**
 This subclass is indented under subclass 200. Subject matter wherein the computer generates a number or sequence of numbers characterized by unpredictability so that no number is any more likely to occur at a given time or place in a sequence than any other.
- SEE OR SEARCH CLASS:
 327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclass 164 for a miscellaneous circuit producing a rectangular waveform having a random characteristic (e.g., random width).
 331, Oscillators, subclass 78 for electrical noise or random wave generation by oscillators (e.g., random pulse generators).
- 251 Oscillator controlled:**
 This subclass is indented under subclass 250. Subject matter wherein the generation is effected by an oscillator or clock.
- 252 Linear feedback shift register:**
 This subclass is indented under subclass 250. Subject matter wherein the generation is performed by a feedback shift register in which a proportional relationship exists between an input and output.
- SEE OR SEARCH CLASS:
 377, Electrical Pulse Counters, Pulse Dividers, or Shift Registers: Circuits and Systems, appropriate subclasses for a shift register, per se.
- 253 Plural parallel output bits:**
 This subclass is indented under subclass 250. Subject matter wherein the generation produces plural bits of a sequence in parallel.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
 256, for plural parallel outputs.
- 254 Seed value controls:**
 This subclass is indented under subclass 250. Subject matter wherein seed value is used as an initial value in the generation.
- 255 Truly random number:**
 This subclass is indented under subclass 250. Subject matter wherein the generation produces a random sequence which is not repeated.
- 256 Plural parallel outputs:**
 This subclass is indented under subclass 250. Subject matter wherein the generation produces plural sequences in parallel.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
 253, for plural parallel output bits.
- 270 Function generation:**
 This subclass is indented under subclass 200. Subject matter wherein a sequence of discrete values is generated to represent a desired waveform.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
 8+, and 845+, for electrical hybrid or electrical analog computers which

perform the function of function generation.

SEE OR SEARCH CLASS:

327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 100+ for miscellaneous signal converting, shaping, or generating circuits.

271 Direct digital frequency synthesizer:

This subclass is indented under subclass 270. Subject matter wherein the generation is performed by a digital frequency source capable of producing a multitude of output frequencies from the desired frequency of the waveform.

SEE OR SEARCH CLASS:

327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 105+ for a synthesizer converting, shaping, or generating a non-linear signal.

272 Memory used to store waveshape:

This subclass is indented under subclass 270. Subject matter wherein a circuit allows a waveshape to be stored and retrieved for generating the waveform.

SEE OR SEARCH CLASS:

327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclass 106 for waveform or waveshape determinative circuits including stored data.

273 Counter as source (i.e., input):

This subclass is indented under subclass 270. Subject matter wherein a circuit counts input pulses for producing phase increments as a source.

274 Linear:

This subclass is indented under subclass 270. Subject matter where the desired waveform is linear.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

8, for a hybrid computer providing piece-wise linear synthesis.
852, for analog triangular, sawtooth or ramp function generation.

275 Circular:

This subclass is indented under subclass 270. Subject matter where the desired waveform represents a circular relationship.

276 Trigonometric:

This subclass is indented under subclass 270. Subject matter where the desired waveform has trigonometric relationships.

277 Logarithmic/exponential:

This subclass is indented under subclass 270. Subject matter where the desired waveform is logarithmic or exponential.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

851, for analog logarithmic/exponential function generation.

290 Interpolation/extrapolation:

This subclass is indented under subclass 200. Subject matter for the determination or estimation of a value or values of a function between two known values or of the trend established between two or more known points.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

313, for decimation/interpolation in digital filtering.
847, for interpolation/extrapolation in analog piece-wise linear function synthesis.

SEE OR SEARCH CLASS:

318, Electricity: Motive Power Systems, subclass 573 for interpolation in positional servo systems.

300 Filtering:

This subclass is indented under subclass 200. Subject matter wherein a computational process or algorithm separates data, signals, or materials in accordance with specified criteria.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

819, for analog computer filtering.

SEE OR SEARCH CLASS:

- 327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 551+ for miscellaneous unwanted signal suppression utilizing an active filter circuit not performing an arithmetic calculation.
- 702, Data Processing: Measuring, Calibrating, or Testing, subclasses 190+ for signal extraction or separation in measured signal processing.

301 Tapped delay line:

This subclass is indented under subclass 300. Subject matter wherein a delay line, in which more than two terminal pairs are associated with a single delay channel, is used to provide delayed signals.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 425, for correlation using tapped delay line.

303 Microprocessor:

This subclass is indented under subclass 300. Subject matter wherein the filtering is performed by a microprocessor.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 231, for a particular microprocessor used in the multifunctional operation.
- 510, for a particular microprocessor used in floating point.

SEE OR SEARCH CLASS:

- 712, Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors) subclasses 32+ for particular microprocessor architecture.

304 Nonlinear (e.g., median, etc.):

This subclass is indented under subclass 300. Subject matter wherein the relationship between the pertinent measures of the input and output signals cannot be adequately described by linear means (e.g., median filter).

SEE OR SEARCH CLASS:

- 382, Image Analysis, subclass 262 for a median image filter.

305 Initialization:

This subclass is indented under subclass 300. Subject matter where the filter is placed in a beginning state prior to the actual processing.

306 Finite arithmetic effect:

This subclass is indented under subclass 300. Subject matter for indication or compensation of an effect arising from the use of operands having a finite length representation.

- (1) Note. Included here are such effects as overflow, underflow and oscillation.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 496, for floating point compensation for finite word length.

307 Delta/differential coded:

This subclass is indented under subclass 300. Subject matter in which the samples used in processing are present in the delta or differential coded format.

SEE OR SEARCH CLASS:

- 341, Coded Data Generation or Conversion, subclasses 76+ for digital conversion to or from a differential code.

308 Multidimensional data:

This subclass is indented under subclass 300. Subject matter where the data to be processed is multidimensional (e.g., image data).

SEE OR SEARCH CLASS:

- 382, Image Analysis, subclasses 254+ for image enhancement which may include filtering.

309 Frequency measurement:

This subclass is indented under subclass 300. Subject matter where frequency determination is accomplished by first removing from a signal corrupting noise which was imposed by a transmission medium.

- SEE OR SEARCH CLASS:
 324, Electricity: Measuring and Testing, subclasses 76.39+ for frequency measurement of cyclic current or voltage in general.
 702, Data Processing: Measuring, Calibrating, or Testing subclasses 75+ for electrical frequency measurement, per se.
- 310 Coherent:**
 This subclass is indented under subclass 300. Subject matter where a particular frequency is eliminated from a signal.
- 311 Frequency detection:**
 This subclass is indented under subclass 300. Subject matter in which a subset of frequencies from a known set of possible frequencies is determined to be present.
- SEE OR SEARCH CLASS:
 327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 39+ for discriminating by frequency.
- 312 Tone detection:**
 This subclass is indented under subclass 310. Subject matter where the subset consists of a single frequency.
- 313 Decimation/interpolation:**
 This subclass is indented under subclass 300. Subject matter where the filter deletes from or adds to the samples input to it in a specified regular fashion resulting in a net sampling rate change.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
 290, for interpolation, per se.
- 314 Matched filter type:**
 This subclass is indented under subclass 300. Subject matter for maximizing the signal-to-noise ratio through the use of filters utilizing correlation techniques.
- SEE OR SEARCH CLASS:
 375, Pulse or Digital Communications, subclass 343 for pulse demodulation or detection by matched filters.
- 315 By convolution:**
 This subclass is indented under subclass 300. Subject matter in which a convolution technique is utilized to accomplish the filtering.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
 420+, for digital convolution, per se.
- 316 Having multiplexing:**
 This subclass is indented under subclass 300. Subject matter where one of a plurality of signals is selected and processed by a given filter or one of a plurality of filters is selected to process a given signal.
- 317 Wave:**
 This subclass is indented under subclass 300. Subject matter in which the filter has elements representing distributed parameters.
- SEE OR SEARCH CLASS:
 333, Wave Transmission Lines and Networks, subclasses 202+ for analog wave filters.
- 318 Lattice:**
 This subclass is indented under subclass 300. Subject matter in which the filter has four computational or delay elements connected in series to form a closed circuit with two nonadjacent ports serving as the input terminals with the other two ports serving as output terminals.
- SEE OR SEARCH CLASS:
 333, Wave Transmission Lines and Networks, subclass 169 for analog lattice filters.
- 319 Transversal:**
 This subclass is indented under subclass 300. Subject matter in which feedforward processing of present inputs is utilized.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
 425, for correlation using tapped delay line.

- 320 Recursive:**
This subclass is indented under subclass 300. Subject matter in which the present filter output is a function of present inputs and past filter outputs.
- 321 Nontime domain:**
This subclass is indented under subclass 300. Subject matter where the data when processed is not in the time domain.
- (1) Note. Frequently this data is in the frequency domain.
- 322 Adaptive:**
This subclass is indented under subclass 300. Subject matter where the transfer function of the filter is automatically changed as a function of the input signal.
- 323 Equalizer:**
This subclass is indented under subclass 321. Subject matter where adaptive compensation for transmission medium noise imposition is performed.
- SEE OR SEARCH CLASS:
375, Pulse or Digital Communications, subclasses 229+ for equalizers in a digital communications system.
- 400 Transform:**
This subclass is indented under subclass 200. Subject matter wherein the digital calculation performs a transformation of a given representation of a data signal to another representation without loss of information by an orthogonal transformation.
- SEE OR SEARCH CLASS:
704, Data Processing: Speech Signal Processing, Linguistics, Language Translation, and Audio Compression/Decompression, subclasses 200+ for speech signal processing.
- 401 Multidimensional:**
This subclass is indented under subclass 400. Subject matter including a specific apparatus which is used for computing an n-dimensional transform of an input signal with n greater or equal to two.
- 402 Discrete Cosine Transform (i.e., DCT):**
This subclass is indented under subclass 400. Subject matter wherein the transformation performed is a Discrete Cosine Transform.
- 403 Fourier:**
This subclass is indented under subclass 400. Subject matter wherein the transformation performed is a mathematical operation which decomposes a time varying signal into its complex frequency components (amplitude and the phase or real and imaginary components).
- SEE OR SEARCH CLASS:
382, Image Analysis, subclass 280 for a Fourier transform performed on image data.
- 404 Fast Fourier Transform (i.e., FFT):**
This subclass is indented under subclass 403. Subject matter wherein the transformation performed is a Fast Fourier Transform.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
405, for Discrete Fourier Transform.
- 405 Discrete Fourier Transform (i.e., DFT):**
This subclass is indented under subclass 403. Subject matter wherein the transformation performed is a Discrete Fourier Transform.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
404, for Fast Fourier Transform.
- 406 Pipeline:**
This subclass is indented under subclass 403. Subject matter wherein the transformation is performed in a pipeline where the output of one task is input to another until a desired sequence of tasks has been carried out.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
233, for multifunctional operation performed in a particular pipeline.
508, for floating point performed in a particular pipeline.
521, for arithmetical pipeline operation in general.

- 631, for multiple digit binary multiplication performed in a particular pipeline.
- 407 Systolic:**
This subclass is indented under subclass 403. Subject matter wherein the transformation is performed by a specific apparatus having an array of computational elements where data is transferred synchronously between nearest neighbor elements.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
509, for a particular systolic array used in floating point.
522, for a particular systolic array used in an arithmetical operation.
- SEE OR SEARCH CLASS:
712, Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors) subclass 19 for systolic array processor architecture.
- 408 Radix greater than two:**
This subclass is indented under subclass 403. Subject matter wherein a specific apparatus is used for computing an n-radix Fourier Transform with n greater than two.
- 409 Butterfly circuit:**
This subclass is indented under subclass 403. Subject matter wherein a specific apparatus performs a complex multiplication and a complex addition or subtraction.
- 410 Walsh:**
This subclass is indented under subclass 400. Subject matter wherein the transformation performed is a Walsh Transform.
- SEE OR SEARCH CLASS:
382, Image Analysis, subclass 281 for image transformation or processing using a Walsh Transform.
- 420 Convolution:**
This subclass is indented under subclass 200. Subject matter which the convolution integral is evaluated in a digital fashion.
- (1) Note. Frequently, the output of a system is determined by convolving the system input with the system impulse response.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
5, for hybrid computer convolution.
315, for convolution in digital filtering.
813+, for analog computer convolution.
- SEE OR SEARCH CLASS:
382, Image Analysis, subclass 279 for convolution in image preliminary processing or transformation.
- 421 Cyclic/circular:**
This subclass is indented under subclass 420. Subject matter where the convolution integral of a and b, two series of discrete values, is found by performing a transform operation on a and b (producing A and B respectively) and then performing the inverse transform operation on the product of A and B.
- 422 Correlation:**
This subclass is indented under subclass 200. Subject matter where the particular function determines the degree of correspondence between two series of discrete values by digitally evaluating the correlation integral.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
5, for hybrid computer correlation.
813+, for analog computer correlation.
- SEE OR SEARCH CLASS:
382, Image Analysis, subclass 278 for correlation in image preliminary processing or transformation.
- 423 Single bit data:**
This subclass is indented under subclass 422. Subject matter in which the discrete values have a one bit representation.
- 424 Multidimensional data:**
This subclass is indented under subclass 422. Subject matter in which at least one series of discrete values is multidimensional (e.g., image data).

- SEE OR SEARCH THIS CLASS, SUB-CLASS:
814, for analog correlation of multidimensional data.
- SEE OR SEARCH CLASS:
382, Image Analysis, subclass 278 for correlation used in image transformation or prerecognition processing.
- 425 Using tapped delay line:**
This subclass is indented under subclass 422. Subject matter where the outputs from successive stages of a digital delay element are utilized.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
301+, for related structure utilized in a filtering environment.
818, for analog correlation having a tapped delay line.
- 426 Autocorrelation:**
This subclass is indented under subclass 422. Subject matter in which both series of discrete values are from a single source.
- 440 Evaluation of trigonometric function:**
This subclass is indented under subclass 200. Subject matter wherein the particular function performed is the processing of a signal either to determine a trigonometric relationship or to operate on a signal in accordance with a trigonometric relationship.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
276, for waveform generation having trigonometric relationships.
811, for evaluation of trigonometric function by analog computer.
- 441 Vector resolver:**
This subclass is indented under subclass 440. Subject matter wherein the signal is a vector and the operation is determining the vector components.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
809, for a vector resolver using analog computer.
- 442 Coordinate conversion:**
This subclass is indented under subclass 200. Subject matter wherein the particular function performed is conversion of coordinates from one coordinate system to another (e.g., rectangular to polar).
- (1) Note. The calculation of the change in coordinates resulting from a translation or rotation of a reference coordinate system is included in this subclass.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
809, for a coordinate conversion using analog computer.
- 443 Differentiation:**
This subclass is indented under subclass 200. Subject matter for differentiation of at least one of a plurality of input signals.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
6, for hybrid computer differentiation.
822, for analog differentiation.
- 444 Integration:**
This subclass is indented under subclass 200. Subject matter for the integration of a sequence of discrete values of an input signal.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
6, for hybrid computer integration.
823+, for analog integration.
- 445 Averaging:**
This subclass is indented under subclass 200. Subject matter for determining the average of a sequence of discrete values.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
805, for analog computer averaging.
- SEE OR SEARCH CLASS:
702, Data Processing: Measuring, Calibrating, or Testing, subclass 194 for averaging in measured signal noise suppression.

- 446 Solving equation:**
This subclass is indented under subclass 200. Subject matter wherein the specialized function performed is to solve an equation.
- (1) Note. Excluded are arithmetical operations.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
490+, for digital arithmetical operations.
- 490 Arithmetical operation:**
This subclass is indented under subclass 200. Subject matter wherein numerical quantities form the elements of the calculation, including the fundamental operations of arithmetic (addition, subtraction, multiplication, comparison, and division).
- 491 Residue number:**
This subclass is indented under subclass 490. Subject matter wherein the numerical digits are in the residue number system.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
532, for residue code error detection or correction.
- 492 Galois field:**
This subclass is indented under subclass 490. Subject matter where the arithmetical operations are performed on a 2 m element finite arithmetic field.
- 493 Multi-valued:**
This subclass is indented under subclass 490. Subject matter where the arithmetical operations are performed with multi-valued operands.
- 494 Incremental mode:**
This subclass is indented under subclass 490. Subject matter wherein the numerical digits represent a change in numbers as opposed to whole number representation.
- SEE OR SEARCH CLASS:
375, Pulse or Digital Communications, subclasses 247+ for delta modulation.
- 495 Floating point:**
This subclass is indented under subclass 490. Subject matter wherein the numerical digits are expressed in terms of a bounded number (mantissa) and a scale factor (characteristic or exponent) consisting of a power of the number base.
- 496 Compensation for finite word length:**
This subclass is indented under subclass 495. Subject matter wherein the operation results in a word modification in length due to insufficient representation of using the fixed word length of the arithmetic system.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
306, for finite arithmetic effect in digital filtering.
550+, for compensation for finite word length used in arithmetical operations.
- 497 Round off or truncation:**
This subclass is indented under subclass 496. Subject matter wherein the modification is a deletion of one or more of the least significant digits and an adjustment of the more significant digits in accordance with some specific rule.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
551, for round off or truncation in arithmetical operations.
- 498 Overflow or underflow:**
This subclass is indented under subclass 496. Subject matter wherein the modification is necessary because the word is either too large or too small to be represented using the fixed word length.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
552, for overflow or underflow used in arithmetical operations.
- 499 Sticky bit:**
This subclass is indented under subclass 496. Subject matter wherein the modification is based on whether or not a number of least significant digits contains a one.

500 Evaluation of root:

This subclass is indented under subclass 495. Subject matter wherein the operation performed is the determination of a root.

SEE OR SEARCH THIS CLASS, SUBCLASS:

605, for evaluation of root by digital arithmetic operations.
807, for analog evaluation of root.

501 Multiplication followed by addition:

This subclass is indented under subclass 495. Subject matter wherein the operation performed is multiplication followed by an addition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

523, for performing a multiplication followed by addition in arithmetic operations.

502 Reciprocal:

This subclass is indented under subclass 495. Subject matter wherein the operation performed is the determination of the reciprocal.

503 Multiplication:

This subclass is indented under subclass 495. Subject matter wherein the operation performed is multiplication.

SEE OR SEARCH THIS CLASS, SUBCLASS:

7, for hybrid computer multiplication.
620+, for performing a multiplication in digital arithmetical operations.
835+, for analog multiplication.

504 Division:

This subclass is indented under subclass 495. Subject matter wherein the operation performed is division.

SEE OR SEARCH THIS CLASS, SUBCLASS:

7, for hybrid computer division.
650+, for division by digital computer.
844, for division by analog computer.

505 Addition or subtraction:

This subclass is indented under subclass 495. Subject matter wherein the operation performed is addition or subtraction.

SEE OR SEARCH THIS CLASS, SUBCLASS:

670+, for addition/subtraction by digital computer.

506 Feedback:

This subclass is indented under subclass 495. Subject matter wherein the operation is effected by the return of a portion of the output to its input.

SEE OR SEARCH THIS CLASS, SUBCLASS:

632, for feeding back partial product to complete the multiple digit binary multiplication.

507 Parallel:

This subclass is indented under subclass 495. Subject matter wherein the operation is effected by the use of two or more processors running simultaneously.

508 Pipeline:

This subclass is indented under subclass 495. Subject matter wherein the operation is effected by passing the output of one task as input to another until a desired sequence of tasks has been carried out.

SEE OR SEARCH THIS CLASS, SUBCLASS:

233, for multifunctional operation performed in a particular pipeline.
406, for Fourier transformation performed in a particular pipeline.
521, for arithmetical pipeline operation in general.
631, for multiple digit binary multiplication performed in a particular pipeline.

509 Systolic:

This subclass is indented under subclass 495. Subject matter wherein the operation is effected by a specific apparatus using an array of computational elements where data is trans-

ferred synchronously between nearest neighbor elements.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

407, for a particular systolic array used in a Fourier transform.

522, for a particular systolic array used in an arithmetical operation.

SEE OR SEARCH CLASS:

712, Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors), subclass 19 for systolic array processor architecture.

510 **Microprocessor:**

This subclass is indented under subclass 495. Subject matter wherein the operation is effected by a microprocessor.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

231, for a particular microprocessor used in a multifunctional operation.

303, for a particular microprocessor used in filtering.

SEE OR SEARCH CLASS:

712, Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors) subclasses 32+ for particular microprocessor architecture.

511 **Complex number format:**

This subclass is indented under subclass 495. Subject matter wherein the numerical digits have a real part and an imaginary part.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

622+, for using complex number format in a multiplication operation.

512 **Logarithmic format:**

This subclass is indented under subclass 495. Subject matter wherein the numerical digits which constitute an operand represented by the exponent to which a base number must be raised to produce the operand.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

517, for logarithmic format in arithmetical operations.

SEE OR SEARCH CLASS:

327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 350+ for miscellaneous circuits providing a logarithmic function of an input signal.

513 **Variable length or precision:**

This subclass is indented under subclass 495. Subject matter wherein the numerical digits which constitute an operand are of selectable length or provide more detail.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

518, for variable length in digital arithmetical operations.

514 **Matrix array:**

This subclass is indented under subclass 495. Subject matter wherein the data is operated on by elements arranged in rows and columns.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

520, for an arithmetic matrix array operation in general.

607, for a particular multiplication of matrices.

SEE OR SEARCH CLASS:

712, Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors) subclasses 2+ for vector processor architecture.

517 **Logarithmic format:**

This subclass is indented under subclass 490. Subject matter where an operand is represented by the exponent to which a base number must be raised to produce the operand.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

512, for logarithmic format in floating point.

518 Variable length:

This subclass is indented under subclass 490. Subject matter wherein the number of numerical digits that represent numbers are of differing length.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

513, for variable length or precision in floating point.

519 Negative radix:

This subclass is indented under subclass 490. Subject matter wherein the numerical digits are represented in negative radix format.

520 Matrix array:

This subclass is indented under subclass 490. Subject matter wherein the data is operated on by elements arranged in rows and columns.

(1) Note. Matrix array processing of multiplication or division per se is classified elsewhere.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

514, for a particular matrix array with floating point.

607, for multiplication of matrices.

620+, for multiplication which may incorporate a matrix array.

650+, for division which may incorporate a matrix array.

SEE OR SEARCH CLASS:

712, Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors) subclasses 2+ for vector processor architecture.

521 Pipeline:

This subclass is indented under subclass 490. Subject matter wherein the operation is performed in a pipeline by passing the output of one task as input to another until a desired sequence of tasks has been carried out.

(1) Note. Pipeline processing of multiplication or division per se is classified elsewhere.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

233, for multifunctional operation performed in a particular pipeline.

406, for Fourier transform performed in a particular pipeline.

508, for floating point performed in a particular pipeline.

620+, for multiplication which may incorporate pipeline processing, particularly

631, for multiple digit binary multiplication performed in a particular pipeline.

650+, for division which may incorporate pipeline processing.

522 Systolic:

This subclass is indented under subclass 490. Subject matter wherein the operation is effected by a specific apparatus using an array of computational elements where data is transferred synchronously between nearest neighbor elements.

(1) Note. Systolic processing of multiplication or division per se is classified elsewhere.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

407, for a particular systolic array used in a Fourier transform.

509, for a particular systolic array used in floating point.

620+, for multiplication which may incorporate systolic processing.

650+, for division which may incorporate systolic processing.

SEE OR SEARCH CLASS:

712, Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors) subclass 19 for systolic array processor architecture.

523 Multiplication followed by addition (i.e., $x*y+z$):

This subclass is indented under subclass 490. Subject matter wherein the operation performed is a multiplication followed by an addition.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:
501, for performing a multiplication followed by addition with floating point.
- 524 Multiple parallel operations:**
This subclass is indented under subclass 490. Subject matter including two or more operations in which numerical digits are transmitted simultaneously on separate lines.
- 525 Status condition/flag generation or use:**
This subclass is indented under subclass 490. Subject matter where an indicator of the present data processing status is generated or used to select from a plurality of future processing paths.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
306, for flag generation or use in a digital filtering finite arithmetic effect environment.
- 530 Error detection or correction:**
This subclass is indented under subclass 490. Subject matter with means identifying a malfunction in the operation of the apparatus or the result produced.
- SEE OR SEARCH CLASS:
714, Error Detection/Correction and Fault Detection/Recovery, appropriate subclass for systems which test for malfunction in nonarithmetical operations.
- 531 Parity check:**
This subclass is indented under subclass 530. Subject matter wherein the error detection or correction utilizes a parity bit.
- SEE OR SEARCH CLASS:
340, Communications: Electrical, subclass 146.2 for detecting error in information content of a group of signals by parity check.
714, Error Detection/Correction and Fault Detection/Recovery, appropriate subclass for systems which test for malfunction in nonarithmetical operations.
- 532 Residue code:**
This subclass is indented under subclass 530. Subject matter wherein the error detection or correction utilizes a residue code.
- (1) Note. The residue is the remainder after dividing a number by a modulus n .
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
491, for residue number arithmetical operation.
- SEE OR SEARCH CLASS:
714, Error Detection/Correction and Fault Detection/Recovery, subclass 808 for error detection by residue code in nonarithmetical operations.
- 533 Sequential repetition:**
This subclass is indented under subclass 530. Subject matter wherein the error detection or correction utilizes sequential repetition.
- 534 Plural parallel devices:**
This subclass is indented under subclass 530. Subject matter wherein the error detection or correction utilizes plural parallel devices.
- SEE OR SEARCH CLASS:
714, Error Detection/Correction and Fault Detection/Recovery subclasses 3+ for fault recovery including masking or reconfiguring, per se, in a digital data processing system and subclasses 820+ for plural parallel devices/channels in nonarithmetical operations.
- 540 Cathode-ray tube:**
This subclass is indented under subclass 490. Subject matter wherein the specific apparatus for performing the arithmetic operation utilizes a cathode-ray tube.
- SEE OR SEARCH CLASS:
315, Electric Lamp and Discharge Devices: Systems, subclasses 1+ for cathode ray tube circuits in general.

541 Contact-making device:

This subclass is indented under subclass 490. Subject matter wherein the specific apparatus for performing the arithmetic operation utilizes a contact-making device such as a relay.

SEE OR SEARCH CLASS:

200, Electricity: Circuit Makers and Breakers, appropriate subclasses for electrical switches, per se.

542 Radix point control:

This subclass is indented under subclass 490. Subject matter for controlling the radix point position relative to the numerical digits, e.g., controlling the position of a decimal point.

SEE OR SEARCH THIS CLASS, SUBCLASS:

498, for overflow or underflow used in floating point.

550 Compensation for finite word length:

This subclass is indented under subclass 490. Subject matter wherein the operation results in a word modification in length due to insufficient representation of using the fixed word length of the arithmetic system.

SEE OR SEARCH THIS CLASS, SUBCLASS:

306, for finite arithmetic effect in digital filtering.
496+, for a particular compensation for finite word length used in a floating point.

551 Round off or truncation:

This subclass is indented under subclass 550. Subject matter wherein the modification is an adjustment of the more significant digits in accordance with some specific rule or a deletion of one or more of the least significant digits.

SEE OR SEARCH THIS CLASS, SUBCLASS:

497, for round off or truncation used in floating point.

552 Overflow or underflow:

This subclass is indented under subclass 550. Subject matter wherein the modification is necessary because the word is either too large or too small to be represented using the fixed word length.

SEE OR SEARCH THIS CLASS, SUBCLASS:

498, for overflow or underflow in floating point processing.

553 Prediction:

This subclass is indented under subclass 552. Subject matter wherein the overflow or underflow is forecasted before the operation is performed.

603 Sum of products generation:

This subclass is indented under subclass 490. Subject matter for producing and adding together a plurality of operand product terms.

SEE OR SEARCH THIS CLASS, SUBCLASS:

319, for similar processing in a transversal filter environment.
420, for similar processing in digital convolution.

604 All four basic functions:

This subclass is indented under subclass 490. Subject matter wherein the computer has the capability of performing the functions of multiplication, division, addition and subtraction.

605 Evaluation of root:

This subclass is indented under subclass 490. Subject matter wherein the arithmetic operation performed is the determination of roots.

SEE OR SEARCH THIS CLASS, SUBCLASS:

807, for evaluation of root by analog computer.

606 Evaluation of powers:

This subclass is indented under subclass 490. Subject matter wherein the arithmetic operation performed is the raising of numbers to powers.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:
808, for evaluation of powers by analog computer.
- 607 Multiplication of matrices:**
This subclass is indented under subclass 490. Subject matter wherein multiplication is performed on plural sets of data arranged in rows and columns.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
514, for a particular floating point matrix array.
520, for a particular arithmetic operation matrix array.
- SEE OR SEARCH CLASS:
712, Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors) subclasses 2+ for vector processor architecture.
- 620 Multiplication:**
This subclass is indented under subclass 490. Subject matter wherein the arithmetic operation performed is multiplication.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
7, for multiplication by hybrid computer.
503, for performing multiplication in floating point.
835, for multiplication by analog computer.
- 622 Complex number format:**
This subclass is indented under subclass 620. Subject matter wherein the numerical digits have a real part and an imaginary part.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
511, for using complex number format in floating point.
- 623 Decimal:**
This subclass is indented under subclass 620. Subject matter wherein the numerical digits are of radix ten.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
624, for coded decimal multiplication.
- 624 Coded decimal:**
This subclass is indented under subclass 620. Subject matter wherein the numerical digits are of radix ten expressed in terms of another lesser radix.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
623, for decimal multiplication.
- 625 Binary:**
This subclass is indented under subclass 620. Subject matter wherein the numerical digits are of radix two.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
624, for arithmetic operations on digits of radix two within a denomination.
654, for division by multiplication by reciprocal.
- 626 Sum of cross products:**
This subclass is indented under subclass 625. Subject matter wherein the multiplication is effected by the sum of cross products technique.
- 627 Repeated addition:**
This subclass is indented under subclass 625. Subject matter wherein the multiplication is effected by the repeated addition technique.
- 628 Multiple digit:**
This subclass is indented under subclass 627. Subject matter wherein at a given instant of time a plurality of multiplier digits control the repeated addition operation.
- 629 Carry-save adders (i.e., CSAs):**
This subclass is indented under subclass 628. Subject matter including an array of carry-save adders to perform the multiplication.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
708, for parallel carry-save adders in binary addition/subtraction.

- 630 Array adders:**
This subclass is indented under subclass 628. Subject matter including an array of circuits or integrated circuits that sum the amplitude of two input signals to perform the multiplication.
- 631 Pipeline:**
This subclass is indented under subclass 628. Subject matter including a specific apparatus passing the output of one task as input to another until a desired sequence of tasks has been carried out.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
233, for multifunctional operation performed in a particular pipeline.
406, for Fourier transformation performed in a particular pipeline.
508, for floating point performed in a particular pipeline.
521, for arithmetical pipeline operation in general.
- 632 Feedback:**
This subclass is indented under subclass 628. Subject matter including means which involves feeding back a partial product as an input to complete the multiplication.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
506, for feeding back a portion of the output to its input in floating point.
- 650 Division:**
This subclass is indented under subclass 490. Subject matter wherein the arithmetic operation performed is division.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
7, for division by hybrid computer.
504, for floating point division.
844, for division by analog computer.
- 651 Decimal:**
This subclass is indented under subclass 650. Subject matter wherein the numerical digits are of radix ten.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
623, for decimal multiplication.
652, for coded decimal division.
- 652 Coded decimal:**
This subclass is indented under subclass 650. Subject matter wherein the numerical digits are of radix ten expressed in terms of another lesser radix.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
624, for coded decimal multiplication.
651, for decimal division.
- 653 Binary:**
This subclass is indented under subclass 650. Subject matter wherein the numerical digits are of radix two.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
625+, for binary multiplication.
- 654 Multiplication by reciprocal:**
This subclass is indented under subclass 653. Subject matter wherein the division is effected by multiplying the dividend by the reciprocal of the divisor.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
625+, for binary multiplication in general.
- 655 Repeated subtraction:**
This subclass is indented under subclass 653. Subject matter wherein the division is effected by the repeated subtraction technique.
- 656 Multiples of divisor:**
This subclass is indented under subclass 655. Subject matter wherein multiples of the divisor are used in the repeated subtraction operation.
- 670 Addition/subtraction:**
This subclass is indented under subclass 490. Subject matter wherein the arithmetic operation performed is addition or subtraction.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:
505, for floating point addition or subtraction.
- SEE OR SEARCH CLASS:
326, Electronic Digital Logic Circuitry, subclass 53 for an electronic digital logic type quarter or half-adder.
327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 355+ for miscellaneous adding or subtracting circuits.
- 671 Comparison:**
This subclass is indented under subclass 670. Subject matter for comparing by determining the mathematical magnitude of the difference between two numbers.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
207, for determination of "maximum of" or "minimum of" a series of numbers by comparison.
- SEE OR SEARCH CLASS:
340, Communications: Electrical, subclass 146.2 for digital comparator system.
- 672 Incrementation/decrementation:**
This subclass is indented under subclass 670. Subject matter for incrementation or decrementation which is performed by changing by one the value of the numerical digit in the least significant digit position.
- SEE OR SEARCH CLASS:
377, Electrical Pulse Counters, Pulse Dividers, or Shift Registers: Circuits and Systems, for electrical pulse counters and counting systems.
- 673 Radix correction:**
This subclass is indented under subclass 670. Subject matter for correction for a change in radix.
- (1) Note. For example, binary coded decimal with "6" correction.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
683, for a device operating in coded decimal fashion that does not require radix correction.
- 674 Serial:**
This subclass is indented under subclass 673. Subject matter wherein the radix correction is performed by operation on the numerical digits in a serial manner.
- 675 Signal amplitude:**
This subclass is indented under subclass 670. Subject matter wherein the addition or subtraction is performed by summing signal amplitudes.
- 676 Microwave:**
This subclass is indented under subclass 670. Subject matter wherein the addition or subtraction is performed utilizing a microwave device.
- 677 Cryogenic:**
This subclass is indented under subclass 670. Subject matter wherein the addition or subtraction is performed utilizing a cryogenic device.
- SEE OR SEARCH CLASS:
505, Superconductor Technology: Apparatus, Material, Process, appropriate subclasses for superconductor technology.
- 678 By electronic tube:**
This subclass is indented under subclass 670. Subject matter wherein the addition or subtraction is performed utilizing an electronic tube.
- 679 Magnetic:**
This subclass is indented under subclass 670. Subject matter wherein the addition or subtraction is performed utilizing a magnetic device.
- 680 Decimal:**
This subclass is indented under subclass 670. Subject matter wherein the numerical digits are of radix ten.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
683+, for coded decimal addition/subtraction.

- 681 Serial:**
This subclass is indented under subclass 680. Subject matter wherein the numerical digits are operated on in a serial manner.
- 682 Parallel:**
This subclass is indented under subclass 680. Subject matter wherein the numerical digits are operated on in a parallel manner.
- 683 Coded decimal:**
This subclass is indented under subclass 670. Subject matter wherein the numerical digits are of radix ten expressed in terms of another lesser radix.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
673, for a device which accomplishes radix correction.
680, for decimal addition/subtraction.
- 684 Serial:**
This subclass is indented under subclass 683. Subject matter wherein the numerical digits are operated on in a serial manner.
- 685 Parallel:**
This subclass is indented under subclass 683. Subject matter wherein the numerical digits are operated on in a parallel manner.
- 700 Binary:**
This subclass is indented under subclass 670. Subject matter wherein the numerical digits are of radix two.
- 701 Bipolar junction transistor only or combined with Field-Effect Transistor:**
This subclass is indented under subclass 700. Subject matter including a transistor that uses both negative and positive charge carriers or combined with a transistor in which current carriers (holes or electrons) are injected at one terminal (the source) and pass to another (the drain) through a channel of semiconductor material whose resistivity depends mainly on the extent to which it is penetrated by a depletion region.
- 702 Field-Effect Transistor (FET):**
This subclass is indented under subclass 700. Subject matter including a transistor in which current carriers (holes or electrons) are injected at one terminal (the source) and pass to another (the drain) through a channel of semiconductor material whose resistivity depends mainly on the extent to which it is penetrated by a depletion region.
- 703 Gate function level:**
This subclass is indented under subclass 700. Subject matter including means to show a gate functional level or combined with a transistor.
- 704 For precharging (e.g., Manchester, etc.):**
This subclass is indented under subclass 700. Subject matter using clock signal for precharging a field-effect transistor.
- 705 Serial:**
This subclass is indented under subclass 700. Subject matter wherein the numerical digits are operated on in a serial manner.
- 706 Parallel:**
This subclass is indented under subclass 700. Subject matter wherein the numerical digits are operated upon in a simultaneous manner.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
507, for providing the digits in a parallel manner in floating point.
- 707 Carry-ripple:**
This subclass is indented under subclass 706. Subject matter wherein a carry signal ripples through each digit.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
711, for block of carry-out signal.
- 708 Carry-save adders:**
This subclass is indented under subclass 706. Subject matter including more than one carry-save adder for performing the addition.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
629, for carry-save adders in binary multiplication.

709 Adding more than two numbers:
This subclass is indented under subclass 706. Subject matter wherein at least three numbers are added.

710 Carry look-ahead:
This subclass is indented under subclass 706. Subject matter wherein the addition or subtraction is performed by a circuit which predicts the final carry from propagate and generate signals supplied by partial adders.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

712, for the carry-out signals of the blocks.

711 Slice block having block ripple:
This subclass is indented under subclass 710. Subject matter wherein carry-out signal of a block ripples through the next block.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

707, for the carry signal ripple through each digit.

712 Slice block having block look-ahead:
This subclass is indented under subclass 710. Subject matter wherein the carry signals of the blocks look-ahead.

713 Tree structured logic blocks:
This subclass is indented under subclass 710. Subject matter including more than one logic block containing one or more nodes that are linked together in a hierarchical fashion.

714 Conditional sums:
This subclass is indented under subclass 706. Subject matter wherein the addition or subtraction is performed utilizing conditional sums.

800 ELECTRICAL ANALOG CALCULATING COMPUTER:

This subclass is indented under the class definition. Subject matter which includes devices for performing calculation operations upon electrical signals, such as current or voltage, which are continuously varying representations of physical quantities and which are some function of the quantities such as direct proportion, inverse proportion or square law relationship.

(1) Note. The limited logic operations include comparison or selection, for example.

(2) Note. The continuously varying representations, for example, may be frequency or pulse width.

(3) Note. Signals wherein the varying representation is pulse rate are included with subject matter under "Electric Digital Calculating Computer".

(4) Note. Examples of the physical quantities above are temperature, pressure, angular position, or weight numerical values.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

1+, for electrical hybrid calculating computers.

100+, for electrical digital calculating computers.

SEE OR SEARCH CLASS:

327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, appropriate subclasses for miscellaneous active device analog circuits.

801 Particular function performed:
This subclass is indented under subclass 800. Subject matter directed to a particular function performed by an analog computer or subcombination thereof in making a computation.

(1) Note. For classification herein the function performed must be significantly claimed in making a computation.

SEE OR SEARCH CLASS:

706, Data Processing: Artificial Intelligence, subclasses 1+ for fuzzy logic hardware and subclasses 15+ for neural networks.

802 Evaluation of equation:
This subclass is indented under subclass 801. Subject matter for obtaining the solution to a mathematical problem.

- (1) Note. The mathematical problem may be expressed as equations, conditions, etc., and the solution may be a value or set of values or the value which meets some objective criteria.
- (2) Note. This subclass includes subject matter which utilized an analog signal as a computing component and in which the computing component is employed more than once to determine a mathematical solution by successive steps.
- (3) Note. This subclass does not include subject matter classifiable as specific types of problems or operations found below.
- 803 Simultaneous:**
This subclass is indented under subclass 802. Subject matter for the solution of simultaneous equations or conditions.
- (1) Note. Linear programming problems are included herein.
- SEE OR SEARCH CLASS:
705, Data Processing: Financial, Business Practice, Management, or Cost/Price Determination, subclasses 7+ for operations research processing.
- 804 Differential (e.g., differential analyzer):**
This subclass is indented under subclass 802. Subject matter wherein the equations evaluated are differential equations.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
102, for differential analyzers of the digital type.
- 805 Averaging:**
This subclass is indented under subclass 801. Subject matter wherein the function performed is determining an average amplitude for a signal.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
445, for averaging by means of a digital calculating computer.
- SEE OR SEARCH CLASS:
702, Data Processing: Measuring, Calibrating, or Testing, subclass 194 for measured signal noise suppression by averaging.
- 806 Variance or standard deviation determination:**
This subclass is indented under subclass 801. Subject matter wherein the function performed is determining variance or standard deviation.
- SEE OR SEARCH CLASS:
702, Data Processing: Measuring, Calibrating, or Testing, subclasses 179+ for statistical measurement.
- 807 Evaluation of root (e.g., square root):**
This subclass is indented under subclass 801. Subject matter wherein the function performed is root evaluation.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
605, for evaluation of root by digital computer.
- SEE OR SEARCH CLASS:
327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 346+ for miscellaneous circuits in which an output signal is exponentially related to an input signal.
- 808 Evaluation of powers:**
This subclass is indented under subclass 801. Subject matter wherein the function performed is the evaluation of the powers of an input signal.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
606, for evaluation of powers by digital computer.
- SEE OR SEARCH CLASS:
327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 346+ for miscellaneous circuits in which an output signal is exponentially related to an input signal.

809 Coordinate conversion or vector resolver:

This subclass is indented under subclass 801. Subject matter wherein the computer converts from one coordinate system to another, such as from rectangular to polar or resolving a vector into its coordinate values.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

441, for a vector resolver using digital computer.

442, for a coordinate conversion using digital computer.

SEE OR SEARCH CLASS:

235, Registers, subclass 61 for coordinate conversion by mechanical computers and subclass 410 for coordinate conversion in ordnance computers.

318, Electricity: Motive Power Systems, subclass 605 for synchros or resolvers used in analog comparison techniques for digital or numerical positional servo systems and subclass 661 for resolver type differential transformer systems used as a particular position measuring instrument for a positional servo error detecting means.

810 Electromechanical:

This subclass is indented under subclass 809. Subject matter wherein the function is performed utilizing an electromechanical device.

811 Evaluation of trigonometric function:

This subclass is indented under subclass 801. Subject matter wherein the function performed is processing of a signal to either determine a trigonometric relationship or to operate on a signal in accordance with a trigonometric relationship.

(1) Note. Generation of a waveform having trigonometric relationship(s) is included herein.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

440, for evaluation of trigonometric function by digital computer.

812 Single triangle:

This subclass is indented under subclass 811. Subject matter which solves for an unknown parameter of a plane triangle.

813 Correlation or convolution:

This subclass is indented under subclass 801. Subject matter for evaluating cross-correlation, auto-correlation, cross-convolution or auto-convolution functions.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

420+, for convolution by digital computer.

422+, for correlation by digital computer.

SEE OR SEARCH CLASS:

324, Electricity: Measuring and Testing, subclasses 76.12+ and indented subclass for correlators used in frequency spectrum analyzer systems.

342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), subclasses 378+ for directive radio wave communications systems using correlation techniques.

367, Communications, Electrical: Acoustic Wave Systems and Devices, subclasses 38+ for correlators used in geophysical communications systems.

814 Of multidimensional data:

This subclass is indented under subclass 813. Subject matter wherein the correlation or convolution is of multidimensional data.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

424, for digital correlation of multidimensional data.

SEE OR SEARCH CLASS:

342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), subclass 5 for correlation functions employed in radar systems with map matching.

815 Acoustic:

This subclass is indented under subclass 813. Subject matter utilizing compressional wave propagation along or through a medium other than a light modulator.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

816, for light modulation using compressional waves.

816 Optical:

This subclass is indented under subclass 813. Subject matter utilizing optical devices and producing an electrical output.

SEE OR SEARCH CLASS:

706, Data Processing: Artificial Intelligence, subclass 40 for optical neural networks.

817 Magnetic or electromagnetic:

This subclass is indented under subclass 813. Subject matter utilizing a magnetic or electromagnetic device.

818 Having tapped delay line:

This subclass is indented under subclass 813. Subject matter utilizing a tapped delay line.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

301, for related structure in digital filtering.

425, for correlation using tapped delay line.

819 Filtering:

This subclass is indented under subclass 801. Subject matter utilized for filtering electrical signals by computation.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

300+, for digital filtering.

SEE OR SEARCH CLASS:

327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 552+ for miscellaneous unwanted signal suppression utilizing an active filter circuit not performing an arithmetic calculation.

333, Wave Transmission Lines and Networks, subclass 18 for filters used in automatically controlled equalizer or delay networks; subclass 28 for analog filters in equalizer coupling networks and subclasses 167+ for analog type transversal filter coupling networks.

375, Pulse or Digital Communications, subclasses 229+ and 285 for filtering techniques used in distortion or noise prevention or correction means for modulated carrier wave communication systems.

455, Telecommunications, subclass 307 for filtering in a radio receiver.

702, Data Processing: Measuring and Testing, subclasses 191+ for measured signal noise suppression.

820. Transform:

This subclass is indented under subclass 801. Subject matter wherein the function performed is transforming a given representation of a data signal to another representation without loss of information by an orthogonal transformation.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

5, for transform by hybrid computer.

400+, for transform by digital calculating computer.

821 Fourier:

This subclass is indented under subclass 820. Subject matter wherein the transformation is from the time or space domain to the frequency domain or the converse.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

403+, for Fourier transform by digital calculating computer.

822 Differentiation:

This subclass is indented under subclass 801. Subject matter wherein the function performed is differentiation of at least one of a plurality of input signals.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

443, for differentiation by a digital computer.

- SEE OR SEARCH CLASS:
327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclass 335 for a miscellaneous circuit providing the derivative of an input signal without computation.
- 823 Integrator:**
This subclass is indented under subclass 801. Subject matter wherein the function performed is integration of at least one of a plurality of input signals.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
444, for integration by a digital computer.
- SEE OR SEARCH CLASS:
327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 336+ for a miscellaneous circuit providing the integral of an input signal without computation.
- 824 Plural integration:**
This subclass is indented under subclass 823. Subject matter wherein the function performed is plural integration.
- 825 Plural mode (e.g., plural scale):**
This subclass is indented under subclass 823. Subject matter wherein the apparatus is capable of operating in plural modes or scales.
- 826 Reset:**
This subclass is indented under subclass 823. Subject matter wherein the integration operation is reset when the output meets a predetermined condition.
- 827 Drift correction:**
This subclass is indented under subclass 823. Subject matter additionally including the function of drift correction.
- SEE OR SEARCH CLASS:
327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclass 307 for miscellaneous baseline or DC offset correction circuits.
- 828 Having simultaneous calculation of another function:**
This subclass is indented under subclass 823. Subject matter where the input signal on which integration is performed is simultaneously subject to a calculation function other than integration and the output is a function of both.
- 829 Having a voltage to frequency converter:**
This subclass is indented under subclass 823. Subject matter utilizing a voltage to frequency converter.
- SEE OR SEARCH CLASS:
327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclass 101 for conversion per se of input current or voltage to output frequency.
- 830 Electromechanical:**
This subclass is indented under subclass 823. Subject matter utilizing an electromechanical device.
- 831 Electro-optical:**
This subclass is indented under subclass 823. Subject matter utilizing an electro-optical device.
- 832 Magnetic or electromagnetic:**
This subclass is indented under subclass 823. Subject matter utilizing a magnetic or electromagnetic device.
- 833 Amplifier with additional feedback loop:**
This subclass is indented under subclass 823. Subject matter utilizing an integrating amplifier with an additional feedback loop.
- SEE OR SEARCH CLASS:
330, Amplifiers, subclasses 75+ for amplifier circuits with signal feedback.
- 834 Additional R/C feedback loop:**
This subclass is indented under subclass 833. Subject matter including a resistance or capacitance in the additional feedback loop.
- 835 Multiplication:**
This subclass is indented under subclass 801. Subject matter wherein the function performed is multiplication.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:
 7, for hybrid computer multiplication.
 620+, for digital multiplication in general.
- SEE OR SEARCH CLASS:
 327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 356+ for a miscellaneous circuit providing the product of a plurality of inputs.
- 836 Time division:**
 This subclass is indented under subclass 835. Subject matter wherein one input variable is used to control the mark-to-space ratio and the other variable is used to control the amplitude of a repetitive rectangular wave.
- (1) Note. Each variable can be represented by current or voltage and the output voltage, proportional to the area of the pulse voltage-time curve, represents the product of the input variables.
- 837 Quarter-square:**
 This subclass is indented under subclass 835. Subject matter wherein the product produced pertains to an analog multiplier whose operation is based upon the identity $xy = (1/4)(x+y)^2 - (1/4)(x-y)^2$.
- 838 Having charging or discharging of energy storage device:**
 This subclass is indented under subclass 835. Subject matter wherein the multiplication function is performed by charging or discharging of an energy storage device.
- SEE OR SEARCH CLASS:
 320, Electricity: Battery or Capacitor Charging or Discharging, subclass 1 or 2+ for a capacitor or battery charging or discharging circuit.
 327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, appropriate subclasses for miscellaneous circuits utilizing the charging or discharging of an energy storage device.
- 839 Photomultiplier:**
 This subclass is indented under subclass 835. Subject matter wherein the multiplication function is performed utilizing photomultipliers.
- SEE OR SEARCH CLASS:
 250, Radiant Energy, subclasses 206+ for photocell controlled circuits in general.
- 840 Electromagnetic:**
 This subclass is indented under subclass 835. Subject matter wherein the multiplication function is performed utilizing an electromagnetic device.
- 841 Hall effect:**
 This subclass is indented under subclass 840. Subject matter utilizing the Hall effect principle.
- SEE OR SEARCH CLASS:
 323, Electricity: Power Supply or Regulation Systems, subclass 294 and 368 for resistor-type impedance systems which operate under Hall effect principles.
 324, Electricity: Measuring and Testing, subclass 207.2 for magnetic measuring using the Hall effect.
 327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclass 511 for miscellaneous Hall effect circuits.
- 842 Electromechanical (e.g., servo-multiplier):**
 This subclass is indented under subclass 835. Subject matter wherein the multiplication function is performed utilizing an electromechanical device.
- 843 Having alternative division:**
 This subclass is indented under subclass 835. Subject matter wherein the function performed is multiplication of two or more inputs and wherein a division is performed as an alternative function.
- 844 Division:**
 This subclass is indented under subclass 801. Subject matter wherein the function performed is division.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

650+, for division by digital computer in general.

SEE OR SEARCH CLASS:

327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclass 360 for miscellaneous circuits where the output is a quotient of a plurality of inputs.

845 **Function generation:**

This subclass is indented under subclass 801. Subject matter wherein the wave shape of at least one analog signal representing a desired function is generated by mathematical operation or a signal is generated as a part of a mathematical operation representing a desired function of at least one variable input parameter.

- (1) Note. This and the indented subclasses include waveform synthesizers of the analog type wherein the waveform is internally generated.
- (2) Note. Trigonometric waveform generation is excluded.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

8+, and 270+, for electrical hybrid or electrical digital computers which perform the function of function generation.

811, for evaluation or generation of trigonometric functions.

SEE OR SEARCH CLASS:

327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 100+ for miscellaneous signal converting, shaping, or generating circuits and subclasses 334+ for miscellaneous circuits providing a function of one or more input signals.

846 **Piece-wise linear synthesis:**

This subclass is indented under subclass 845. Subject matter wherein the desired function is approximated by a series of segments of straight lines.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

9, for a hybrid computer performing piece-wise linear synthesis.

SEE OR SEARCH CLASS:

327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 334+ for a miscellaneous circuit providing a piece-wise approximation to a desired input to output function.

847 **Interpolation/extrapolation:**

This subclass is indented under subclass 846. Subject matter including determining or estimating a value or values between two or more known predetermined points or by continuing the trend established between two or more known points.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

290, for interpolation/extrapolation by digital computer.

848 **Diode breakpoint:**

This subclass is indented under subclass 846. Subject matter wherein the function is performed by a network or networks of resistors and diodes in which the diodes begin to conduct at different values (breakpoints) of an input signal.

SEE OR SEARCH CLASS:

327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 583+ for miscellaneous diode circuits.

849 **Cathode-ray tube:**

This subclass is indented under subclass 845. Subject matter wherein sensing a pattern within or external to the envelope of a cathode-ray tube produces a function signal.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

540, for a cathode ray tube used in digital arithmetical operation.

SEE OR SEARCH CLASS:

340, Communications: Electrical, subclass 324 for multiple variation cathode ray display electrical communication systems.

850 Two or more variables:

This subclass is indented under subclass 845. Subject matter wherein the signal represents two or more variables.

851 Logarithmic/exponential:

This subclass is indented under subclass 845. Subject matter wherein the particular generated function is logarithmic/exponential.

SEE OR SEARCH THIS CLASS, SUBCLASS:

277, for logarithmic/exponential function generation by digital computer.

SEE OR SEARCH CLASS:

327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 350+ for miscellaneous circuits providing a logarithmic function of an input signal.

852 Triangular, sawtooth, or ramp:

This subclass is indented under subclass 845. Subject matter wherein the particular generated function is of the triangular, sawtooth or ramp type.

SEE OR SEARCH THIS CLASS, SUBCLASS:

274, for a linear function generator by digital computer.

SEE OR SEARCH CLASS:

327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 131+ for miscellaneous circuits providing a sawtooth or ramp type waveform.

853 Hyperbolic:

This subclass is indented under subclass 845. Subject matter wherein the particular generated function is hyperbolic.

854 Electromechanical:

This subclass is indented under subclass 845. Subject matter wherein the function is performed utilizing an electromechanical device.

END